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ABSTRACT

The telecommunications terminal (TER) comprises a processor (CPU), which controls the terminal by means of executing a program contained in a memory (MEM). The program is loaded into the memory (MEM) from a telecommunication network (NET).

According to the invention the program is a program packet, comprised of program modules, where each program module is suitable for executing a performance feature of the telecommunications terminal (TER). The program modules can be loaded individually. The terminal comprises a configuration table, where each currently loaded program module is entered. When the terminal is started up, only a base set of program modules is loaded into the memory. When a feature is to be executed, whose program module is not loaded, it is downloaded dynamically to the run time. With this method, the terminal can be matched flexibly to the current utilisation situation.

(Figure 2).

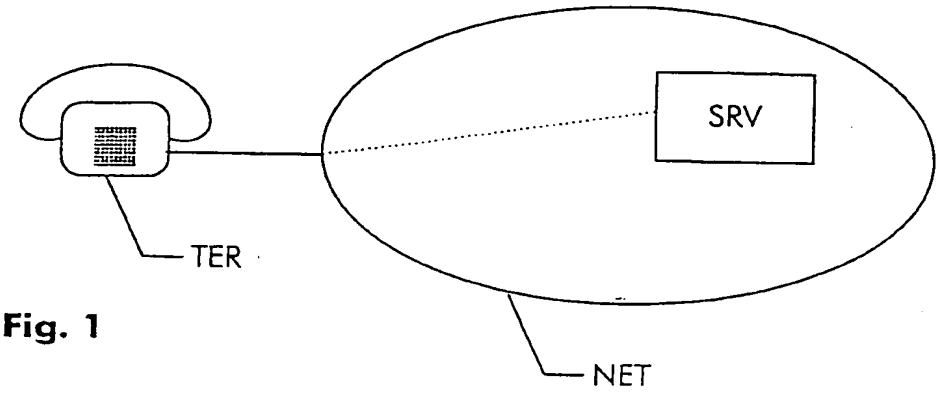

Fig. 1

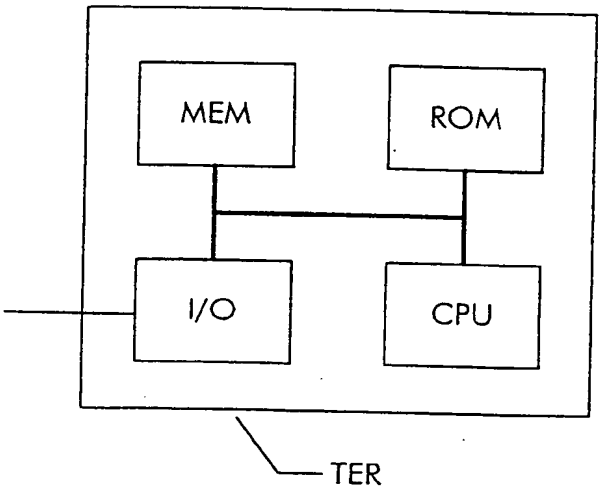

Fig. 2

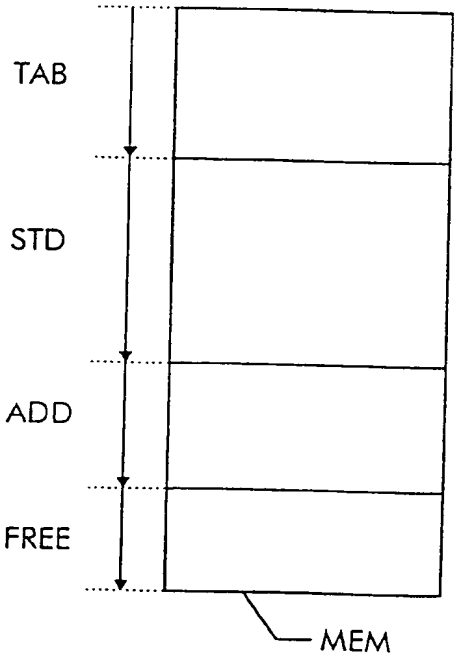

Fig. 3

P/00/011 28/5/91
Regulation 3.2

AUSTRALIA

Patents Act 1990

ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title:

"SOFTWARE CONTROLLED SUBSCRIBER TERMINAL"

The following statement is a full description of this invention, including the best method of performing it known to us:-

This invention relates to a telecommunications terminal with a processor for controlling the terminal, a memory which comprises a program provided for controlling the terminal and with means for loading the program from a telecommunication network.

A telecommunications terminal which can be connected to a telecommunication network is known from the Australian Patent No. 643526, said terminal being controlled by a microprocessor and comprising a memory, wherein a software program for controlling the terminal is stored. Furthermore, the terminal comprises a read-only memory with a download software, by means of which the software program can be downloaded from the telecommunication network to the memory. Preferably, the terminal has two separate memories, where one contains the software program which is currently being executed, and a new software program can be loaded simultaneously into the other memory. This means that operation is not affected during loading.

The described terminal has the disadvantage that the software program can only be loaded as a whole into the memory and that the software program also contains functions and features which are not currently required.

It is an object of the present invention to specify a software controlled telecommunications terminal which can be adapted flexibly to the current utilisation situation. A further task of the invention is to specify a server for a telecommunication network, which supplies the control software for the operation of such a software controlled telecommunications terminal. A further task is to specify a method for operating the telecommunications terminal.

According to the first aspect of the invention there is provided a telecommunications terminal with a processor for controlling the terminal, a memory which comprises a program provided for controlling the terminal and with means for loading the program from a telecommunication network, wherein,

- the program is comprised of program modules and each program module is suitable for carrying out a performance feature of the telecommunications terminal,
- the program modules can be loaded individually into the memory and
- the terminal comprises a configuration table, in which each currently

loaded program module is entered.

According to the second aspect of the invention there is provided a server for a telecommunication network with means for supplying a program for controlling a telecommunications terminal in the telecommunication network,
wherein,

- the program is comprised of program modules and each program module is suitable for carrying out a performance feature of the telecommunications terminal
- the program modules can be requested individually from the server.

According to the third aspect of the invention there is provided a method for operating a telecommunications terminal, which is controlled by a processor by executing a program stored in a memory of the telecommunications terminal, wherein, when starting up the telecommunications terminal by means of a loading module of the telecommunications terminal, a connection is established to a telecommunication network, and the program is loaded from the telecommunication network into the memory, wherein,

- the program is comprised of program modules and each program module is suitable for carrying out a performance feature of the telecommunications terminal,
- a base set of program modules is loaded into the memory and
- it is entered in a configuration table which program modules are loaded into the memory.

The invention has the advantage, that the terminal has the same performance scope while requiring a smaller memory than known software controlled terminals. It is a further advantage that the program, or individual program modules, provided for the control of the terminal can be updated quite easily. It is a further advantage, that the loading time for a dynamic program load is reduced, particular when starting up the terminal.

In order that the invention may be readily carried into effect, embodiments thereof will now be described in relation to the accompanying drawings, in which:

Figure 1 shows a terminal according to the invention, connected to a telecommunication network,

Figure 2 shows a block diagram of a terminal according to the invention,

Figure 3 shows an example for the memory allocation in a terminal according to the invention and

Figure 4 shows a flow diagram of a method according to the invention.

A basic idea of the invention is to provide a software-controlled telecommunications terminal, and to not load the program for controlling the terminal as a whole via the telecommunication network, but in program modules. With this method, only the currently required program modules are to be loaded into the terminal. When further, additional features are required during operation of the terminal, the necessary program modules can be loaded later on-line and configured automatically. This program therefore represents a software which can be configured dynamically in run time.

A telecommunications terminal TER according to the invention is shown in a first practical example in Figure 1. The terminal TER is connected to a telecommunication network NET. The telecommunication network comprises a central server SRV. Software-controlled terminals can download a control program from the central server SRV. The software program is a program package and is comprised of several program modules, which can be loaded individually. Each performance feature of the terminal is implemented by a separate program module. When the terminal TER is started up, it downloads a base set of program modules from the server SRV into a memory. The terminal comprises a configuration table, in which all the program modules currently stored in the memory are entered. This allows a check whether the program module for a certain, currently to be executed or to be activated feature, is loaded. When this is not the case, the corresponding program module can be loaded prior to executing the feature.

In this context, performance features are understood to be functions and services, which can be executed, activated or requested by the terminal. A program module, which executes the corresponding function or supports the corresponding service, is provided for each of these features.

It is advantageous that the base set is stored in a user profile. With this, for example, a user can identify himself to the server by means of a user identification when starting up the terminal and authenticate himself by means of a password or a

secret number. After this form of identification, the user specific user profile is read and the program modules listed therein are loaded into the memory of the terminal. In this manner, the program modules, which the user generally or regularly uses, can be loaded for each user, and this can be determined, e.g. by means of a user statistic, or the user can predetermine his requirements. This means that those program modules are loaded, whose utilisation by the corresponding user can be expected with a high degree of probability.

In this context, starting up means each switching on of the terminal. A network change also means a starting up of the terminal in the new network, e.g. with mobile radio networks. However, the software does not have to be loaded into the terminal with each start up, it can be stored permanently in the terminal. In this case, a complete new download is only necessary when the network or network operator is changed, or when a new version of the software is available (update).

Instead of a central server, the program package can also be supplied as a distributed application in the telecommunication network, for example in a mobile radio network, where there is always the next closest server available for supplying currently required program modules.

A block diagram of the telecommunications terminal TER is shown in Figure 2. The terminal TER comprises a processor CPU, which controls the terminal, a memory MEM, into which the control program consisting of program modules can be loaded, an input/output interface I/O and a read-only memory ROM, comprising a loading module to load the program. The processor CPU, memory MEM, read-only memory ROM and the input/output interface I/O are all connected via a bus. The input/output interface is connected to the telecommunication network. The telecommunication network can be a line network, (for example an ISDN network) or a radio network (for example a GSM network). The loading module is a type of operating system, which can establish a first connection with the telecommunication network, to load the required program modules into the memory.

The memory MEM can be a non-volatile memory, which can be electrically deleted, e.g. an EEPROM memory. This has the advantage, that the last stored program modules are retained when starting up. A simple version comparison is all that is required to determine whether a new version of the program modules must be

downloaded from the telecommunication network.

Alternatively, the memory can also be a volatile memory, for example a DRAM. This can be of advantage, for example for mobile radios, which are to be used within networks of different network operators. When starting up, the memory is initially empty and is automatically loaded with the program modules of the network operator, in whose area of reception the mobile radio is located.

The memory MEM of telecommunications terminal TER is allocated as follows in the practical example shown in Figure 3 as a schematic representation: The configuration table is stored in a first storage area TAB. It contains information about which program modules are contained in the following storage areas. The base set of program modules is stored in a second memory area ESS. This is preferentially a selection of program modules, which are required for the essential basic functions of the terminal. Additional program modules are contained in a third memory area ADD, and there are program modules which are, for example, loaded later , i.e. only at the point of time where the corresponding function or the corresponding feature was executed or requested. The fourth storage area FREE is a free storage area. Further program modules can be loaded in this area. When the free storage area is exhausted, preferably those program modules will be deleted from the third storage area ADD, which are currently not required. This memory organisation means that the memory can be smaller than it would be in the case of a traditional terminal.

Alternatively, the configuration table can be stored in a separate memory. Preferentially, the configuration table comprises additional configuration parameters for the program modules, e.g. an indicator to the storage location at which the corresponding program module is stored.

The telecommunications terminal can be a telephone, a mobile telephone, a fax, an Internet telephone, or a similar piece of equipment for conducting telecommunication services. Examples for services for the execution of which additional program modules are subsequently loaded are the Short Message Service, call forwarding, call diversion, recall-when-busy, or conference connections.

In a preferred practical example, the program modules are written in a script language, for example in the Java language. In this case the terminal contains an interpreter for the script language in addition to the loading module. This enables the

program modules to be used in a platform independent manner, i.e. independent of the type and manufacturer of the terminal.

The invention enables a network operator or a services provider to provide a certain user who has, for example, registered himself in the previously described manner, with only those features and functions in the form of corresponding program modules, for which the user has signed a service contract. In this case, e.g only those program modules are provided, which have been listed as available in the user profile. It is also possible for the network operator or services provider, to charge a lump-sum fee when a program module is requested.

Figure 4 shows a flow diagram for the method according to the invention, of the practical example. After starting up the telecommunications terminal, the following steps are carried out:

Step S1: A connection is established to the telecommunications network by means of the loading module contained in the read-only memory.

Step S2: The user profile is read and the program modules entered therein as the base set are loaded into the memory of the telecommunications terminal.

Step S3: The loaded program modules are entered in the configuration table of the telecommunications terminal. The telecommunications terminal is then ready for operation.

Step S4: A performance feature is now to be executed. The feature to be executed is, as example, designated with an X.

Step S5: For this purpose, it is first checked by means of the configuration table, whether the program module required for the execution of feature X is already contained in the memory. When this is the case, the next step, Step S8 will be executed (execution of the corresponding program module by the processor).

Step S6: When the program module for the corresponding feature is not contained in the memory, it is now loaded from the telecommunication network into the memory.

Step S7: The new loaded program module is now entered in the configuration table.

Step S8: The processor executes the corresponding program module.

Step S9: If a further feature of the telecommunications terminal is to be

executed, the steps S5 to S8 are repeated. If not, the procedure is finished, e.g. by shutting off the terminal.

A server according to the invention comprises means for supplying the control program in the telecommunication network. This includes access means to the telecommunication network, such as an interface and a device for generating data units according to the transmission protocols used in the telecommunication network. Furthermore, these include storage means, in which the control program is stored, and means for transmitting the corresponding program modules of the control program individually to the terminal when a terminal has requested these. Furthermore, the server has a base set of program modules defined, preferentially for each user, which, when a terminal is started up, i.e. when a previously not-registered terminal signs in with the server, are transmitted to this.

The claims defining the invention are as follows:

1. A telecommunications terminal with a processor for controlling the terminal, a memory which comprises a program provided for controlling the terminal and with means for loading the program from a telecommunication network, wherein,

- the program is comprised of program modules and each program module is suitable for carrying out a performance feature of the telecommunications terminal,
- the program modules can be loaded individually into the memory and
- the terminal comprises a configuration table, in which each currently loaded program module is entered.

2. A telecommunications terminal as claimed in claim 1, wherein configuration parameters, which are specific to the relevant program module are additionally stored in the configuration table.

3. A telecommunications terminal as claimed in claim 1, controlled by the processor so that a program module for a performance feature, which is currently not loaded, is loaded when a request for executing the feature occurs.

4. A telecommunications terminal as claimed in claim 1, wherein the means for loading the program comprise a read-only memory, wherein a loading module for executing the loading procedures is stored.

5. A telecommunications terminal as claimed in claim 1, wherein the program modules are loaded from central servers of the telecommunication network.

6. A telecommunications terminal as claimed in claim 1, wherein the memory is a non-volatile memory which can be deleted electrically.

7. A telecommunications terminal as claimed in claim 1, wherein the memory is a volatile memory.

8. A telecommunications terminal as claimed in claim 1, controlled by the processor so that only a base set of program modules is loaded when the terminal is started up.

9. A telecommunications terminal as claimed in claim 1, wherein the program modules are written in a script language.

10. A server for a telecommunication network with means for supplying a program for controlling a telecommunications terminal in the telecommunication network,

wherein,

- the program is comprised of program modules and each program module is suitable for carrying out a performance feature of the telecommunications terminal,
- the program modules can be requested individually from the server.

11. A server as claimed in claim 10, which transfers a base set of program modules to the telecommunications terminal, when the telecommunications terminal is started up.

12. A server as claimed in claim 11, wherein the base set is stored in a user specific user profile.

13. A method for operating a telecommunications terminal, which is controlled by a processor by executing a program stored in a memory of the telecommunications terminal, wherein, when starting up the telecommunications terminal by means of a loading module of the telecommunications terminal, a connection is established to a telecommunication network, and the program is loaded from the telecommunication network into the memory, wherein,

- the program is comprised of program modules and each program module is suitable for carrying out a performance feature of the telecommunications terminal,
- a base set of program modules is loaded into the memory and
- it is entered in a configuration table which program modules are loaded into the memory.

14. A method as claimed in claim 13, wherein, when there is a request for execution of a performance feature, the configuration table is used to check whether a program module for this feature is contained in the memory and that this program module is loaded into the memory from the telecommunication network, when it is not available in the memory.

15. A telecommunications terminal, substantially as herein described with reference to Figures 1-4 of the accompanying drawings.

16. A server, substantially as herein described with reference to Figures 1-4 of the accompanying drawings.

17. A method, substantially as herein described with reference to Figures 1-4 of the accompanying drawings.

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DATED THIS TWELFTH DAY OF NOVEMBER 1998

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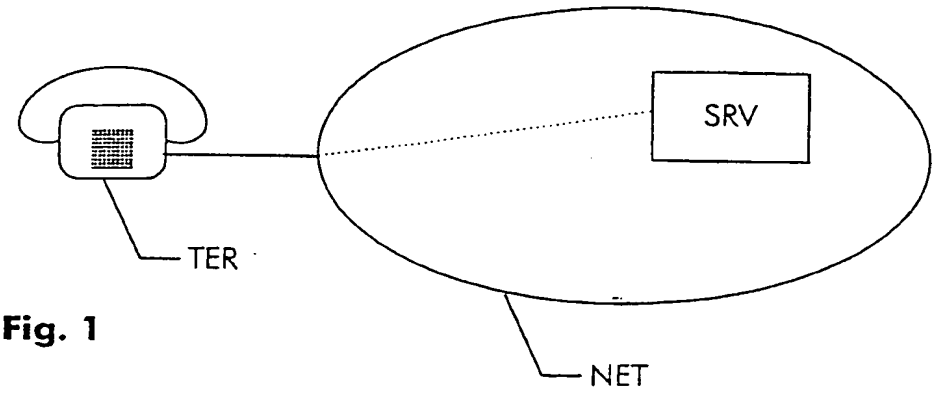

Fig. 1

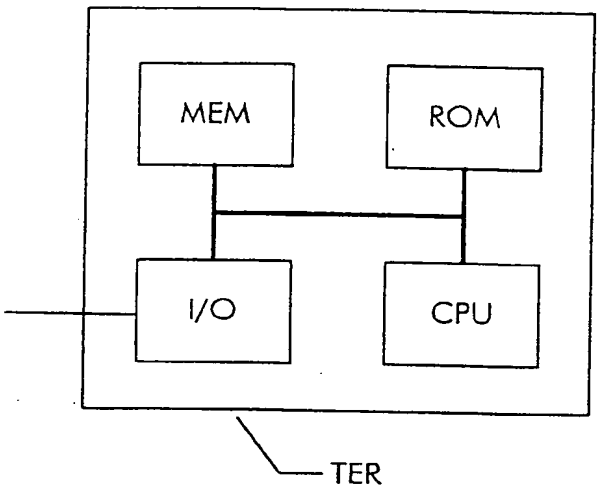

Fig. 2

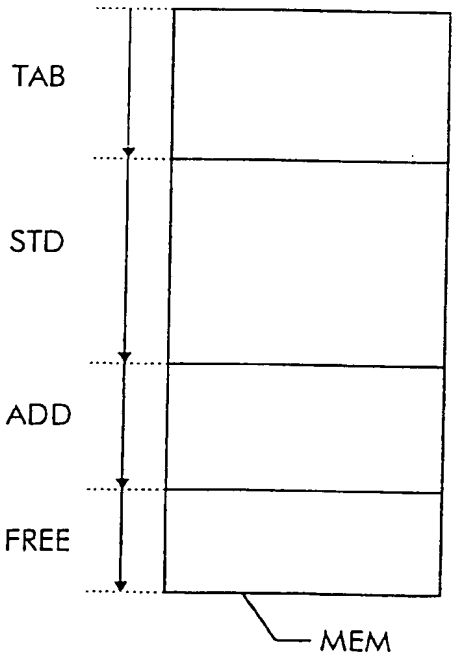

Fig. 3

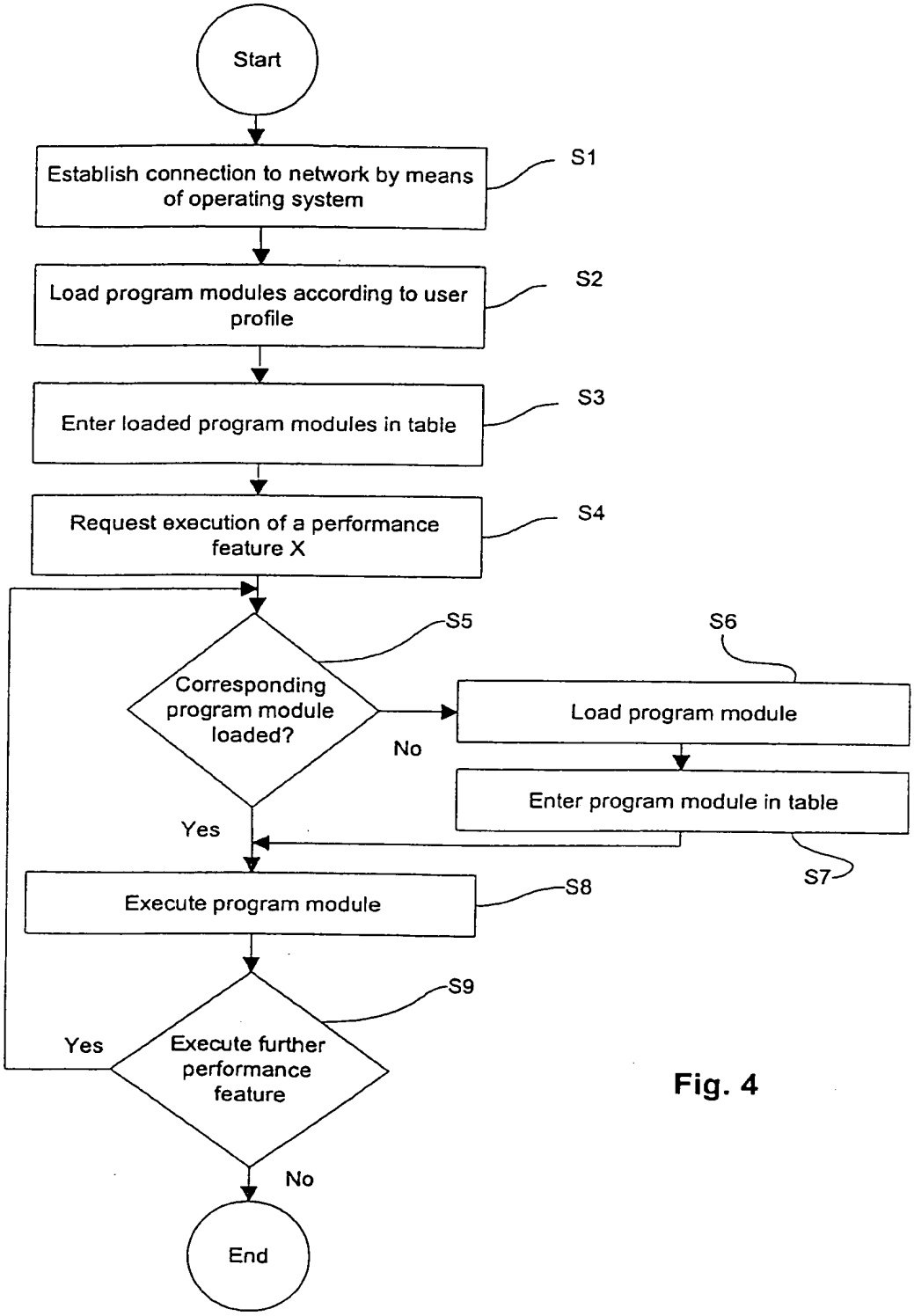
Start
Establish connection to network by means of operating system
S1
Load program modules according to user profile
S2
Enter loaded program modules in table
S3
Request execution of a performance feature X
S4
S5
Corresponding program module loaded?
No
S6
Load program module
Enter program module in table
S7
Yes
Execute program module
S8
S9
Yes
Execute further performance feature
No
End

Fig. 4